Editor: Jack Richard   March 1. 1987

BITS

TIME: Need the correct time to set your system clock? National Bureau of Standards radio station WWV maintains a free telephone time service at 499-7111. They announce Universal Coordinated Time with tone each minute. If you don't want to wait a full minute, the Naval Observatory Time Service provides Universal Time and Eastern Standard Time alternately each five seconds with tone from the U.S. Naval Observatory master clock. This is the official time base for the United States - available at (900)410-8463. ($0.50 charge per call). Local time and temperature are always available from TV Channel 4's service at 837-4467.

CALL WAITING: The CALL WAITING feature allows you to detect incoming telephone calls by way of a discreet "click" in the earpiece when an incoming call is on line. Unfortunately, this click murders file transfers made via modem. Fortunately, you can disable call waiting using either of two methods. In many areas you can disable it for the duration of a single call by entering *70 (touch tone) or 1170 (rotary dial) before the desired number. This disables call waiting only until the current call is completed. For multiple call protection, use the CALL FORWARD feature to forward all calls to another number. Although this causes the phone to ring sharply once, it apparently doesn't interrupt modem file transfers.

US ROBOTICS MODEMS: US Robotics is offering qualified BBS sysops a discount price of $495 on its new 9600 baud Courier HST model - normally priced at $995. Additionally, sysops can get a $300 discount on the company's Courier 2400e, Courier 2400, and Microlink 2400 models. US Robotics can be reached via modem at (312)982-5092.

COMMODORE PC: Commodore Business Machines Inc. has announced two PC compatible MS-DOS computers. The $999 PC10-1 features 512K bytes RAM, 1 360K disk drive and an ATI Graphics Solutions video card supporting CGA, Monochrome, Hercules Graphics, and Plantronics modes. The $1199 PC10-2 adds a second disk drive and provides a full 640K RAM. Commodore Business Machines, 1200 Wilson Dr., West Chester, PA 19380 (215)431-9100

LINE SURGE PROTECTOR: Curtiss Manufacturing Co. has announced a $19.95 phone line surge protector that plugs into a 3-prong AC outlet. Two modular connectors allow line surges to shunt to AC ground. Curtiss Manufacturing Co. 305 Union St. Peterborough, NH 03458. (603)924-3823.

TYPESETTING: Transmit text files to Intergraphics typesetting service over toll free telephone lines. Same day service - MC/Visa. Info (800)368-3342.

LOCAL SERVICE

<u>C.A.R.L</u>: Have you tried the Colorado Association of Research Libraries (C.A.R.L.) online research service? For students, writers, and researchers, this service provides an excellent resource for locating books on any subject. Logon requires no name, address, access, or subscription fee. Simply connect, select a library from a list including the Denver Public Library, Colorado University Libraries and others, and begin searching. Searches can be conducted by title, phrase, authors name, or just a generic term. The database will reply with a list of applicable books, authors, subject description, call number, library location, and whether or not it is currently checked out.

I tried for over an hour to find a generic research subject that would stump this database. Not only did it find entries for everything I could dream up, but it did so with speed that can only be attributed to a mainframe.

Additionally, C.A.R.L has separate 300, 1200, and 2400 baud lines. It is always easy to get on.

```
300 BAUD  830 1165
1200 BAUD 830-1546
          830-1547
          830-1548
2400 BAUD 830 0519
```

<u>DEMENTIA</u>: The Denver chapter of the American MENSA organization provides a local BBS titled Dementia at 989-8470. Chuck Pelto is the sysop and the system is up 24 hours at 300 and 1200 baud. The system runs on an Apple computer and both MENSA members and visiting public are welcome. One interesting feature of this board is its propensity for issuing earthy anecdotes with each prompt. They have some unique and interesting discussions on several of their 11 discussion boards. MENSA is an international society in which the sole requirement for membership is a score at or above the 98th percentile on standardized IQ tests.

<u>WATERTON COMPUTER CLUB</u>: The Waterton Computer Club has opened their BBS to all Martin Marietta Employees. This is an excellent PC based board with a large base of public domain software. Open 24 hours at 977-7995.

<u>CHRISTIAN PROTOCOL</u> The Christian Protocol BBS 426-4052 was down for a few weeks in February due to a modem malfunction. Christian Protocol provides a Christian ministry via BBS. Notably, the entire text of the King James Version of the Bible is available for download. The system features the SCRIPTURE.PAS database system - a public domain search program written in Turbo Pascal and distributed by Computers for Christ, a San Jose CA religious group. This program allows callers to search any or all books of the Bible for any text string. The program provides reference to chapter and verse and provides a brief context where the text string was found. Christian Protocol also allows download of the SCRIPTURE.PAS program for users who want to set up their own biblical search database. Sysop Ken Johansen notes that this board will be moving to a new number soon. Keep us posted Ken.

LONG DISTANCE

STC BOARD: The Society for Technical Communication provides an electronic BBS at (202)393-3557. The board is directed at members and provides a large database of job opportunities for technical writers as well as word processing software/utilities. The BBS supports 300/1200 baud operation 24 hours daily. Peter R. Herbst is the sysop. Voice telephone is (202)737-0035 or write to 815 Fifteenth Street, NW, Washington, DC 20005

CLEVELAND FREE-NET Case Western Reserve University, The Ohio Bell Telephone Company, and the Information Systems Division of AT&T have sponsored the Cleveland Free-Net BBS at (216)368-3888. This BBS takes a little bit different approach in that they identify themselves as a CITY BBS system and they offer the outstanding software they have developed for this BBS to other cities for a $1 lease. They predict cities all over the country will support BBS systems within a few years. Denver - are you listening?

Using Cleveland Free-Net, you can enter questions on almost any subject via the message boards and receive informed answers from University Staff and governmental representatives, usually within 24 hours. Browsing through past questions and answers can be fascinating. We learned that the adult human vascular system stretches for nearly 60,000 miles and that apple seeds contain small amounts of cyanide poison.

The Cleveland Free-Net year-end report indicates that their "experiment" has enjoyed some success. They currently average 340 logons daily. Yet we logged on twice on a Saturday afternoon with little difficulty. This is an open board requiring no registration for browsing and absolutely no negative sniveling or whining from the sysop about user abuse. They present a very positive and professional view of the "electronic city." Clearly one of the most exciting and informative National Boards available.

SOFTLOGIC SOLUTIONS Softlogic Solutions has made quite an impression on the PC compatible sector with its Disk Optimizer, Software Carousel, and DoubleDos, programs. Now the company announces a BBS support line at (603)644-5556 for news and questions concerning Softlogic software.

BPI ADLINE Business People Inc. sponsors over 40 tech fairs in 21 major cities each year where prospective employers can meet with technical professionals. Now BPI sponsors a free job search BBS at (612)941-3957. This board provides information on a number of companies currently hiring technical staff. And, it provides a facility for uploading your resume to a specific company. Recently we logged on and found detailed info about the following companies: BankAmerica, Emerson Electric, GTE, LTV, Northrup, Rohr, Sperry. In addition to general info on company history and benefits, each firm provided detailed info on current job openings and recent contract awards as well as application information. No fee required - enter BPI for the logon password.

COMM PRODUCTS

ADC TELEPHONE MODEM: One equipment item necessary for telecomputing is, of course, the modem. Falling modem prices have made the move up from 300 to 1200 baud attractive. Long distance charges, pay service charges, and personal time spent on-line, all make the switch economically justifiable as well. Computer Direct, an Austin Texas mail order firm, is currently offering the choice of external or internal, 300/1200 baud Hayes compatible modem for $119.00 with no shipping charges, credit card surcharges, or sales tax.

Computer Direct shipped our ADC 1200 Telephone Modem the day after taking our telephone order for the external model. UPS delivered the unit five days later. .The case was a grey plastic not quite up to the brushed aluminum finish on the ubiquitous Hayes 300/1200. But the front panel indicators are if anything more readable than Hayes. Further inspection rendered some pleasant surprises. The usual dip switches were mounted on the bottom of the case rather than inside with the function of each switch clearly printed on the case. The rear panel includes the usual RS-232 port and two modular line connectors rather than the single line connector provided on the Hayes model.

In operation, the ADC emulates the Hayes AT command set admirably and we encountered no difficulties running several lengthy script files at both 300 and 1200 baud. Additionally, the ADC contains an on-board clock which can be accessed from your comm program using the *T command. This clock also allows the modem to detect a busy signal and automatically redial the number after 30 seconds.

After several days of testing we found we preferred the $119 ADC Telephone Modem to the $389 Hayes 300/1200. Computer Direct can be reached at (800)225-5655.

PROCOMM VERSION 2.4.2: Another requisite item for telecomputing is communications software. For IBM PC/Compatible owners, the "shareware" communications programs are generally as good as, and by many accounts, better than commercially available programs costing hundreds of dollars. One such program is ProComm Version 2.4.2. ProComm was originally written by a Columbia Missouri group known as PIL Software Systems. They now go by the name Datastorm Technologies Inc. and they insist that it is "User Supported Software" rather than freeware or public domain. The nuance is lost on us as they ask that you distribute it freely. ProComm Version 2.4.2 fixes a few "quirks" of the earlier versions and uses a much more English-like syntax in the script language. The program provides for a 100 entry directory with command files keyed to directory entries. With the proper command file, you can simply enter the directory entry number and the program will not only dial the corresponding bulletin board but log on as well. File transfers appear to perform very well and are convenient to execute. Some Denver area BBS systems report file transfer difficulties (Control Systems II BBS at 841 6065). Particularly noted were YMODEM transfer difficulties. We had no problems with this. The program features "exploding window" screens that appear to grow from a single point and customization of screen features

in an endless combination of colors and highlights. One notable feature is the ALT-A command which invokes an editor - but no editor is supplied. You specify your favorite editor in a setup screen and subsequently ALT-A will invoke it instantaneously. We use Word Perfect 4.1 as our editor (a bit of overkill) quite successfully. ProComm Version 2.4.2 is available for download locally from Denver Tech Center BBS at 799 4813 or directly from PIL Software in Columbia Missouri at (314)449-9401. The authors ask for a $25 registration and maintain a separate support bulletin board for registered user's - an interesting and welcome feature.

UTILITIES

The following public domain /shareware utilities run on IBM PC/Compatible computers and are available on local BBS systems.

SCRTIME.COM: This utility is not too complex. Enter SCRTIME and for the rest of your session a small digital readout of time appears discreetly and constantly in the upper right hand corner of your IBM compatible screen. Some programs use the top screen line for the display for messages - otherwise, this one works with everything. Author unknown.

SIMCGA.ARC: Chuck Guzis, 153 North Murphy Ave. Sunnyvale, CA 94086. This utility is so poorly behaved we hesitate to mention it. But it fills a need ignored by the rest of the computing community. This utility allows the Hercules Monochrome Graphics Adapter to simulate the IBM Color Graphics Adapter (CGA). IBM Clone sales have skyrocketed recently with most systems

equipped with Hercules compatible graphics cards and monochrome monitors. The graphics resolution of these cards is quite good (748x320) if you don't mind foregoing color. But a large body of software (games particularly) require a CGA card to operate and do not support the Hercules graphics standard.

SIMCGA.ARC contains SIMCGA.COM, SETCGA.COM, SETMONO.COM, and SIMCGA.DOC. The SIMCGA.COM file initializes a memory resident utility that simulates a CGA card to "most" software. SETMONO.COM and SETCGA.COM allow free switching between CGA and Hercules modes.

The documentation states that the SIMCGA utility supports "almost" all software requiring a CGA card. Our experience was otherwise. Many programs simply do not work with SIMCGA. So why mention it at all? The program does work with a few key game programs including the public domain CHESS.EXE programs, TREK25, and RISK. And when SIMCGA works, it works exceptionally well. The chess display is better with the Hercules card than with the CGA adapter using our monitors. Unfortunately, when it doesn't work it usually locks up the system.

ARC CLONES: The ARC51 series of file compression utilities has become a standard for reducing the byte count of programs stored on BBS all over the country. The program allows you to compress a series of files into one single archive using 2/3 the disk real estate with a corresponding decrease in transmission time. As a result, BBS sysops and users have embraced this program with such enthusiasm that anyone wanting to use software

downloaded from a BBS must first get ARC51.COM so they can decompress it. (Programs are quite useless in archived form without ARC51).

Any commercial software company would lust after the exposure System Enhancement Associates has had with this product. Now, even shareware like ARC51 is subject to clones. ARCA.COM, ARCE.COM, and ARCV.COM simulate the ARC add, extract, and verbose commands of ARC51. And they do it very well. These individual command files may lack elegance and certainly something should be done about their names, but in size they are small (averaging 2K bytes per) and _fast_ (half again as quick as ARC51). The clones perform all intermediate file operations in memory rather than on disk - thus speeding the functions.

450 BAUD

Most of us began telecomputing with 300 baud modems. Recently, falling prices have made 1200 baud modems more common. And, many users opt for the newer, and still expensive, 2400 baud modems. But, several local PC based BBS have begun listing 450 baud operations as a supported transmission rate. What is 450 baud?

Like many innovations, 450 baud evolved in the hobbyist community in response to the need for speed. Homebrewers found that there was no built in hardware speed limitation to their 300 baud modems. They could "juice up" performance of 300 baud modems via software and still maintain acceptable error rates at up to 450 baud. The key is the IBM PC 8250 communications controller.

Modem baud rate is actually controlled by the rate at which the PC sends data to the modem. This rate is determined by dividing an internal time base by a two-byte baud rate divisor stored in the 8250 chip's registers. Actually, the 8250 is programmable for speeds up to 19600 baud, although IBM officially acknowledges 9600 baud as the top rate.

To set the baud rate for COM1 to 450 baud, we must first set the high order bit of the 8250 line control register (03FB hex) to 1 by ANDing the value in 03FB with 80 hex. This allows us access to the baud rate divisor byte registers at 03F8 and 03F9 hex. Store a value of 00 in 03F8 and 01 in 03F9 to specify 450 baud. Finally, OR the value in the line control register 03FB with 80 hex to return the high order bit to zero. Subsequent transmissions will then occur at 450 baud.

Although error rates for some 300 baud modems may be slightly higher at 450 baud, the error checking routines in XMODEM and XMODEM-CRC should compensate. However, transmitting a few extra blocks because of errors may decrease the advantage of the higher baud rate. The BASIC program listed below will set the 8250 chip for 450 baud operations:

```
OUT &H3FB,(INP(&H3FB)AND &H80)
OUT &H3F8,0
OUT &H3F9,1
OUT &H3FB,(INP(&H3FB) OR &H80)
```

More information on the 8250 chip is available in the IBM technical reference manual.

PROTOCOL TUTORIAL

Transmitting program and text files from one computer to another over the phone lines is one of the primary allures to telecomputing. However, much confusion exists concerning the different file transfer procedures available.

To be able to transfer a data file from one computer to another via modem, both computers must agree on some "telephone line etiquette" for handling the transfer. Which computer is sending, which one is receiving, timing for transfer start, and error checking, are some of the preliminaries vital to effective transfer. These details comprise a set of transfer rules called a protocol.

A number of file transfer protocols are in common use today. The most common are: XMODEM, XMODEM-CRC, YMODEM and KERMIT. Perhaps the most confusing and daunting element of telecomputing for the novice is understanding the purpose and differences among these different protocols. Each issue, Denver PC Boardwatch will present a description of a different protocol type.

Because many protocols are variations on the techniques used in XMODEM, in this issue we will examine the history and development of Ward Christensen's original XMODEM protocol. Much of this information is extracted from Ward Christensen's documentation of XMODEM written August 1982.

XMODEM: XMODEM refers to the original 1979 file transfer protocol introduced by Ward Christensen's MODEM2 program. This program provided a communications package for CP/M computers and XMODEM was one of the earlier file transfer programs to gain wide acceptance in the infant personal computer industry. XMODEM outlasted the many others no longer available mainly because of its simplicity. Mr. Christensen himself acknowledges that there were earlier PC protocols and even that some of them were well documented and supported by user groups. None were as simple and as easy to implement as XMODEM.

THE BASICS: The XMODEM protocol allows the transfer of files between two computers by breaking up the file into 128-byte blocks and transmitting them one at a time to the receiving computer. After each block is transmitted, the receiving computer either returns a byte to the sender indicating that the block was received error free, or that the block was garbled in transmission by line noise or other error. If the block was received OK, the sender sends the next block in series from the file. If the block was garbled, the sender retransmits the block in its entirety. After attempting to send a single block ten consecutive times without success, the sender will abort the file transfer. The communications parameters required for actual transmission of an XMODEM file are 8 bit bytes, no parity check, and 1 stop bit. This transmission is asynchronous, half-duplex. Only one computer can talk at a time.

BLOCK MAKEUP: Although the data block is defined as 128 bytes in length, the actual transmitted block is 132 bytes. This block consists of:

Byte 1. SOH (start of heading) decimal 1/hexadecimal 1

Byte 2. Block number in binary

Byte 3. 255 minus block 2 value

Bytes 4-131.   128 data bytes.

Byte 132. A checksum byte for error detection.

The SOH simply signals the start of the block. Byte 2 contains a binary number representing the block number. Byte 3 is the ones-complement, calculated by simply reversing each bit of byte 2 (you can also think of this as decimal 255 minus the decimal value of byte 2). The 128 data bytes may contain binary data, ASCII, or virtually anything since the bytes are not checked for control characters. Note that the last block transmitted will still contain 128 bytes even if the file ends in mid-block. The block is simply padded out with zeroes. Byte 132 is a checksum byte calculated by summing the binary value of each of the previous bytes and discarding any carry over the 8 bit limits of the checksum byte.

INITIATING TRANSMISSION: The receiving computer system actually initiates file transfer by transmitting a NAK (negative acknowledge - decimal 21/hexadecimal 15) every 10 seconds indefinitely. Once the sender is ready, it will wait approximately one minute for the next NAK from the receiver and take that as a signal to begin transmission. It sends the SOH, the two byte file number

identifier, the 128 data bytes and the 1 byte checksum for the first block.

The receiving computer checks several items concerning the incoming block. First it checks whether the correct block has been transmitted. The block should be either a repeat of the last block sent (if the receiver sent a NAK the last block or if the ACK response it sent was missed by the sender) or the next consecutive block number. The receiver calculates a checksum as each byte is received and compares the result with the last byte of the block - which should contain the same checksum as calculated by the sender.

If the correct block is received and the checksum calculations match, the receiver sends an ACK (ACKnowledge - dec 6/hex 6) byte back to the sender. If the checksums do not match or an incorrect block number is received, the receiver sends a NAK (negative acknowledge - 21 dec/15 hex) byte.

If the sender receives an ACK byte return from the receiver, it transmits the next 132 byte block in the series by incrementing the block number, retrieving the 128 data bytes, and adding the calculated checksum. If the sender receives a NAK reply from the receiver, it retransmits the last block sent in its entirety. It will retransmit a single block up to ten times before aborting a file transfer. Once the sender has sent the final block and received the ACK reply, it transmits an EOT (end of transmission - dec 4/hex 4) indicating the file transfer is complete. The receiver acknowledges the EOT again with an ACK. The sender will repeat EOT until ACK is returned.

Either receiver or sender can abort the file transfer by replacing the SOH (sender cancels) or ACK or NAK (receiver) bytes with a CAN (cancel - dec 24/hex 18) byte. The diagram below depicts a sample 3 block transfer with a

data loss during transmission of block 2.

<u>NEXT ISSUE</u>: Decreasing errors - adding John Byrns 16 bit Cyclic Redundancy Check CRC-16 to XMODEM to create XMODEM-CRC.

<u>SENDER</u>	<u>RECEIVER</u>
	<NAK>
<SOH> <1> <254> [128 data bytes] <cksum>	
	<ACK>
<SOH> <2> <253> [128 data bytes] <cksum>	
	<NAK> (noisy line)
<SOH> <2> <253> [128 data bytes] <cksum>	
	<ACK>
<SOH> <3> <252> [128 data bytes] <cksum>	
	<ACK>
<EOT>	
	<ACK>

EDITOR'S NOTES

The Denver area telecomputing community is alive and growing. This premier issue of <u>Denver PC Boardwatch</u> presents a list of 161 electronic bulletin board systems (BBS) confirmed operational in the Denver/ Boulder area during February 1987. If each board averages 20 calls daily, users are logging on at a rate of over 3000 daily. We would conservatively estimate 10,000 active telecomputing enthusiasts in the area.

This thriving electronic village begs a focal point for information and news of interest to system operators and users. Most of the BBS lists available for download are woefully out of date. Some of the telephone numbers we contacted in compiling these listings had not been operating for over two years. A number of our contacts were with people who had recently been assigned the number by Mountain Bell. They

really did not understand why the were harassed by 12 to 15 calls daily from the "computer people."

After compiling these lists, we also understand why sysops, already swamped with hundreds of software titles and mysteriously malfunctioning hard disk systems, might be hesitant to invest a few hundred hours confirming the existence of other BBS to update their lists.

<u>Denver PC Boardwatch</u> proposes to fill the role of information clearing house serving the Denver area telecomputing community. We will provide an accurate, up-to-date list of active BBS systems, reviews of the many excellent shareware/public domain programs and utilities available for download, and news of products and services of interest to our readers. We will present educational articles for the novice detailing the vagaries of file transfer, common protocols, and communications software.

We will highlight notable local bulletin board systems that feature innovative new applications or services or cater to specific interest groups. We will call your attention to unusual, interesting, or useful national on-line resources. Finally, we intend to provide timely information on legal developments affecting the BBS sytem operator or user.

As with any publication, the degree to which we succeed will ultimately depend on our readers. Contributions of technical articles, news tips, corrections to the BBS lists, or editorial comment on relevant subjects are solicited and appreciated. We would ask system operators particularly to keep us advised of any change in status of their systems and we will gladly alter any description listed to be more specific or informative.

We hope you find Denver PC Boardwatch useful, timely, and interesting.

Jack Richard

DENVER PC BOARDWATCH SUBSCRIPTION FORM

Name:_____

Address:_____

City:_____ State:_____ Zip:_____

Please enclose $12 check or money order for six issues (one year) of Denver PC Boardwatch. Mail to:

Denver PC Boardwatch
5970 South Vivian Street
Littleton, CO 80127

SYSOPS QUESTIONAIRE

BBS TITLE:_____

PURPOSE/DESCRIPTION:_____

HOURS:_____ BAUD:_____ TEL:_____

HARDWARE:_____ SOFTWARE:_____

BBS LISTS

The main feature of this newsletter is the BBS list. A number of local BBS maintain lists of other BBS available for download. In composing these listings, we found most of the download lists to be outdated and inaccurate. And, we found out why. Confirming the existance of a couple of hundred BBS can be a tremendous task — certainly more work than the average sysop has time for. List maintenance is one role this newsletter will try to fill. And we believe it to be an important one.

For one thing, the legal status of electronic BBS is under constant review — with pressures brought to bear by the telephone company, local special interest groups, and even national intelligence agencies. The public perception of electronic BBS, system operators, and computer enthusiasts in general, can affect all of us in the future. We have attempted telephone contact with every telephone number in this newsletter. Unfortunately, we encountered too many individuals whose telephone numbers appear on BBS lists, but who have no involvement with computers or BBS systems. These people are plagued with a number of calls each day from novice users who download a BBS list and go exploring. Some of the BBS numbers we contacted claimed to have been down for over two years.

In this edition, we are providing three BBS lists: A CONFIRMED UP list, a DOWN BBS list, and an INFO NEEDED list.

CONFIRMED UP:. This is a list of BBS systems confirmed to be currently in operation.

Confirmation was either by logon or aural tone detection. Contacts were attempted during the first three weeks of February 1987. Future Denver PC Boardwatch editions will repeat this list, and confirmations will be repeated with each edition. Note that a number of the listings are not complete as to type of system and description. This listing is maintained on the R:base System V database program. If you would like to alter the description of your BBS or provide additional information on any of these systems, please do so. Your participation ensures our accuracy.

DOWN BBS LIST: This list is made up of contacts made with one of two results: either we talked with the resident and received information that the board was down, or we received a disconnect recording from the telephone company. Please delete these BBS from your download lists. It is possible that some of these boards still exist at a new number. We would be happy to learn of the continued existence of any of these boards.

INFO NEEDED LIST: This is our "lost sheep" list made up of contacts resulting in no answer after 5 or more rings or a busy signal. A minimum of three attempts were made per number. Most of these BBS resulted in no answer but a few were constantly busy. These we attempted to contact as many as ten times. They may be the most popular boards in the area, but we do not include any board on our UP list without hearing a tone or logging on. Any information you can provide on the status of these boards will be appreciated. Reader updates will be included in the next issue.

BOARD	TELEPHONE	BAUD	HRS	DESCRIPTION	SYSTEM
Aces High	329 6579	3	24	Programming/general messages	Franklin
Advertising Connection	744 1595	3/12	24	Advertising/Commercial with SIG Sections	TRS
Amnet	1 223 1297	3/12	24	Commodore/Amiga/C language	IBM
Apple Pi Board	422 3716	3/12	24	Apple user group messages/downloads	Apple
Atlantis	973 8369	3/12	24	Apple, MAC, Message	Apple
Aurora Net	688 9292	3/12	24	28 Meg messages/downloads	Apple
Aurthur's Den	688 1724	3	-8-	Commodore	Commodore
Avalon	699 6868	3/12	-8-	City on the edge of forever (fantasy)	-8-
Baha'i Board	449 3386	3/12	24	Religious/philosophy/Baha'i faith	IBM
Bank, The	771 7531	3/12	24-	Not accepting new accounts	Apple
Barnacle Bills	428 8372	3/12	24	Apple II Messages	Apple II
Boulder FIDO	497 6969	3/12/24	24	Messages and downloads	IBM
Boulder MAC Maniacs	666 7543	3/12	24	MAC Messages	Apple II
Box's Cabin, The	424 9185	3/12	24	Apple/Technical Notes	Apple
Buck Board, The	427 9539	3/12	24	Veterans messages, TRS-88, Amiga	TRS
C.A.R.L.	838 1547	3/12	24	Colorado Assoc. Research Libraries	Mainframe
C.A.R.L.	838 1548	3/12	24	Colorado Assoc. Research Libraries	Mainframe
C.A.R.L.	838 1165	3	24	Colorado Assoc. Research Libraries	Mainframe
C.A.R.L.	838 1546	3/12	24	Colorado Assoc. Research Libraries	Mainframe
C.A.R.L.	838 8519	24	24	Colorado Assoc. Research Libraries	Mainframe
Castle Dark Horn	741 5278	-8-	-8-	-8-	-8-
Chariot	1 632 3391	3/12	24	Unix/Conferences/NAPLPS graphics	-8-
Chip's Ahoy AE TAC	693 2452	3	24	Apple with ASCII express only	Apple
Christian Protocol	426 4852	3/12/24	24	Christian messages/bible text	Epson
Club House, The	756 9134	3/12	24	RP Games/golf format/messages	Apple
Coco County Airport	343 6787	3/12	24	TRS Color computer support	CoCo
Colorado Commodore Club BBS	452 8544	3/12	24	Commodore Info	C-64
Colorado Sno-Bank	671 7669	3/12	24	Ski, roads, winter rec info	IBM
Colorado University	447 2548	3/12	24	University mainframes (require access)	Mainframe
Comm-net Information Service	366 3898	3/12	24	* Jokes/weather/sports line *	C-64
Comm-Net Information Service	348 2473	3/12	24	* These four lines all access the same *	C-64
Comm-Net Information Service	366 7177	3/12	24	* C-64/C-128/Amiga Info-dnlds-messages *	C-64
Comm-Net Information Service	366 2341	3/12	24	* excellent info for Commodore products*	C-64
Comm-Post	534 4646	3/12	24	SIGS/Jokes/Messages	-8-
Communications Station	232 2828	3/12	24	Online RP, helpful bulletins, wantads	C-64
Computer Farm	1 632 8669	3/12	24	-8-	IBM
Computers Unlimited	762 9122	3/12	24	Sanyo MBC-55X Support	Sanyo
Computerworks	665 8789	3/12	24	Macintosh/IBM PC Info exchange	MAC
Control Systems II	841 6865	3/12/24	24	Free access version with 63M downloads	IBM
Control Systems Premier	458 6248	12/24	24	IBM/Compatibles subscription board	IBM
Controller Board/TBBS Island	698 9423	3/12	24	Computer supplies	TRS
COSUG	1 531 9674	-8-	-8-	Fidonet	-8-
CP/M SIG INC IBM	465 1313	3/12	24	Oldest user's group in area CP/M - IBM	IBM
CPU Board	1 772 7229	3/12	24	Downloads and useful BBS info	TRS
Crossroads	989 8397	3/12	24	Discussion	TRS
CS BBS Service I	1 531 6668	3/12	24	Subscriber access fidonet	-8-
CS BBS Service II	1 531 6667	3/12	24	Southern Colorado Fidonet	Zenith
Data Bank	494 8167	3/12/24	24	IBM Messages	IBM
Day's End	658 5636	3/12/24	24	-8-	IBM
Deaf Net	989 9245	3/12	24	Hearing impaired / computing	Apple
Deathstar	286 8938	3/12	8p-6a	Fun posting	C-64
Dementia	989 8478	3/12	24	American MENSA BBS	Apple
Den HUG	331 8982	3/12	24	Denver Heath Group	Heath
Denver Tech Center BBS	799 4813	3/12/24	24	IBM	IBM
Denver Video Board	343 1579	3/12	28	Audio Visual production,jokes,downloads	C-128

DENVER PC BOARDWATCH
CONFIRMED UP BBS LISTING

BOARD	TELEPHONE	BAUD	HRS	DESCRIPTION	SYSTEM
Dialamatch 118/The Brokerage	796 9721	3	24	Adult matchmaking	Franklin
Dive Link	252 9235	3/12	24	Scuba and rescue messages	IBM
Dragon's Shadow	841 3721	3	24	-8-	-8-
Eagles Nest	1 598 8413	3/12	24	Eagleview Middle School Fidonet	IBM
Electric Land ST	449 3227	-8-	-8-	Ataris	Atari ST
Enterprise	988 1384	3/12	24	28 boards/18 dwnld sections/games/trivia	Apple
Entertainment Line	969 9518	3/12	24	Color computer support	CoCo
ETA Denver	758 5842	3/12	24	ANSI, messages wx forecast downloads	Tandy
Eusebeia Fido	438 8376	3/12	24	Bible downloads and messages	IBM
Experience Software	798 8792	3	24	Franklin Messages	Franklin
Fantasy Mountain	278 8369	3/12	24	Art/Downloads	CP/M
Fare, The	449 1928	3	24	Apple II Messages	Apple
Fiddler's Fido #334	674 1859	3/12	24	IBM Equestrian	IBM
Fidonet #56	973 9338	3/12/24	24	IBM Messages	IBM
Flea Market, The	433 1158	3	24	Commodore messages/downloads/ads	C-64
Galafrea	987 8161	3/12	24	C-64 downloads/messages	C-64
Genesis Project	287 8267	3/12	24	Apple II General	Apple
George Net	322 4779	3/12	24	General message/download	IBM
Grizzly King	666 8824	3/12	24	Outdoor messages/IBM software/INFO-MAT	IBM
Grotto, The	694 9858	3/12/24	24	Amiga, Pascal	IBM
Hack Shack	688 8486	3/12	24	Commodore	C-64
Hard Rock Cafe	287 1588	3/12	3p-2a	RBBS information	IBM
HIP Shack	1 593 8766	3/12	24	Southern Colorado Fidonet	IBM
Hozerville	933 0986	-8-	-8-	Atari 8 BIT	Atari
Inner Limits	458 6238	3	24	Atari	Atari
Intercomex	367 1935	3/12/24	24	TRS 80	TRS
JeffCo Schools BBS	973 2548	3/12	24	Apple II education	Apple
King's Market Bookshop	665 6891	3/12	24	Computers, books, etc	TRS
Kingdom III	789 4961	-8-	24	Atari messages	Atari
Kings Bench	377 6725	3/12	24	Tandy 1888 only/$2 reg fee/messages	TANDY1888
Lakewood Department of Safety	987 7388	3/12	24	Police sponsored - law enforcement msgs	IBM
Lakewood RCPM/RBBS	985 1188	3/12	24	CP/M MS DOS Downloads	CP/M
Land of Lindon	987 2894	-8-	-8-	-8-	-8-
Last Chance Fido	1 633 4711	-8-	-8-	-8-	-8-
LES-COM-NET	233 5824	3/12	24	Lesley College	Apple
Locksmiths's Annex	698 1623	3	24	21Meg of downloads	CP/M
Magic	791 8732	3/12	24	Macintosh/Apple GS	MAC
Mailbox BBS	658 6876	3	9p-6a	C-64/sports/HAM/Ads	C-64
Menagerie	425 7461	3	-8-	General Atari board	-8-
Metro Computer Exchange	753 6677	3/12	24	IBM - C64 messages and downloads	IBM
Metro Data Exchange	838 2445	3	24	-8-	Commodore
Micro-1848	289 2861	3	24	Income tax assistance	TRS
Microlink B	972 4181	3/12	24	Programming/general	IBM
Mile Hi Forum	431 1484	3/12	24	Atari	Atari
Mile High Software Exchange	738 2258	3/12	24	Amiga/Apple downloads - messages	Apple
Modem Net	688 8153	3	24	Order entry - 38 boards - Apple	-8-
Musician's Den	321 6857	3/12	7p-9a	Music interests -24 hours on Sunday	Compaq
My Fido	795 1215	3/12	24	Messages/downloads for gays	IBM
Mycroft	777 8898	-8-	-8-	-8-	-8-
Networks Unlimited	296 3218	3/12/24	24	Messages/downloads/polls	IBM
Night Shift, The	322 1544	3/12	24	Casino, football	Apple II
Odyssey 2	691 0169	3	24	Apple II subscriber swingers	Apple
Old West	393 7519	3/12	24	BBS list, RP games,high score list,msg	C-128
One on One	423 7124	3/12	24	Dating/Personals	-8-
Overboard	695 8931	-8-	24	Overland High School	Apple

DENVER PC BOARDWATCH
CONFIRMED UP BBS LISTING

BOARD	TELEPHONE	BAUD	HRS	DESCRIPTION	SYSTEM
PACE	428 3696	3/12	24	Practical Apologetics/Christian Evangel.	-0-
PC Computer Brokers	452 9567	3/12	24	IBM,Epson Equity,TRS-80 Club Msgs	IBM
PC Jr. Net	789 4610	3/12/24	24	IBM PC Jr.	IBM
Pencils	477 9548	3	24	Business/office supplies	Atari
Phone Connection	426 7969	3/12	nights	Commodore	C-64
Photo Tech BBS	781 1079	3/12	24	TRS 80/ HAM/Video/camera	TRS
Point of No Return	388 5437	3	24	Music/General	-0-
PSINet	985 2634	3/12	24	Parapsychology	TRS
Purgatory	841 5176	3	24	On-line arena/8 boards Apple	Apple
Reggae Land	698 8144	3	10p-6a	Commodore	C-64
Regimental Headquarters	375 9556	3/12	24	Commodore	C-128
Retreat, The	369 7852	3/12	24	Christian Gospel/Prayer	Apple
Retreat, The	733 1689	3/12	24	Christian Gospel / prayer	Apple
Revelstone	722 5886	3	5p-2a	-0-	-0-
Rocky Mountain 99'ers	423 2654	3/12	24	Texas Instruments 99/4A Messages/dwnlds	TI99
Rocky Mountain Atari Svc	447 2227	3	24	Atari Info	Atari
Rocky Mountain RBBS	750 2187	-0-	-0-	-0-	-0-
Ron and Shannons AMIS	978 8298	3	24	Insulting to non-Ataris	Atari
Sensoria II	762 8669	3	24	Apple II RP Games	Apple
Shaman Exchange	969 8585	-0-	-0-	Multiline system	Apple
Skyline Computers	457 8320	3	24	Atari Messages	Atari
Solid Software	1 591 4273	-0-	-0-	-0-	-0-
Space Network	494 8446	3/12	24	IBM Space Info	-0-
Spam Mania	423 8348	-0-	-0-	-0-	-0-
Stampede	799 9733	3/12/24	6p-10a	Atari/Amiga messages/downloads	Atari
Starcross	699 6619	3/12	24	Apple Infocom	Apple
Stratagem	771 6647	3/12	24	Online games/messages/dnlds	IBM
Swinging Singles	467 3832	3	8a-5p	Adults only	-0-
T-Zone	427 7114	3/12	24	Apple II	Apple
TAC Headquarters	322 8337	3	24	Commodore	C-64
Taj Mahal/World Trade Center	451 7222	3/12	24	20 Mb	Apple
TBBS Parlor	455 3283	3/12	24	Kaypro Matchmaking/Castles	Kaypro
TBBS#1 of Denver	792 2832	3/12	24	Apparat computer BBS	-0-
Teletalk	447 2735	-0-	24	Telecommunications messages	CP/M
Teletran	371 7645	3/12	24	Commodore online games	C-64
Temple of Doom	771 9523	-0-	-0-	Very poor connection - couldn't logon	-0-
Temple of Mendal	494 7224	3/12	24	Commodore 64 downloads	C-64
TI Link	499 1822	3/12	24	General	IBM
Toadscape, The	741 5863	3/12	24	-0-	Atari
Trekker World	745 9530	3/12	7a-10p	Apple games/messages	Apple
Turbo Connection	423 3114	3/12	24	IBM Games, messages, downloads	IBM
UFONet of Colorado	278 4244	3/12	24	Scifi-password required-no new users	-0-
Unknown TBBS	988 8155	3/12	24	BBS lists, Jokes, Amigas	CP/M
UPAS	665 8586	3	24	Unix	-0-
UPAS	665 8585	12	24	Unix	-0-
Vault, The	796 8539	-0-	-0-	USAF/IMAB Member	Atari
Vipertron/ PCP BBS	722 2633	3/12	24	Atari messages, surveys	Atari
Waterton Computer Club	977 7995	3/12/24	5p-7a we	Martin Marietta Employees 3DM dnlds	IBM
Werdna's Lair II	331 9276	3	24	Games	Apple
White Runes of Tinuviel	972 8566	3/12	24	Atari computers/Tolkien subjects	Atari ST
World Peace	320 4822	3/12/24	24	Current events, politics	Heath

DENVER PC BOARDWATCH
DOWN BBS LISTING

BOARD	TELEPHONE	BAUD	HRS	DESCRIPTION	SYSTEM
Andromeda System	371 3137	-0-	24	Role playing games	Franklin
Apple Corps	758 7389	3	4P-8A	Messages	Apple
Charlie's Fido	659 3151	3/12	8P-6A	IBM/Messages	IBM
Cotton Club	693 0516	-0-	10p-9a	Apple II GBBS code mods	Apple
Court Room	773 9291	3	24	Apple II General Messages	Apple
Data-Line	320 4102	3	24	Commodore 64 Messages and downloads	C-64
Electronic Locksmith	973 2167	-0-	24	Osborne/CPM	Osborne
Epson Mountain States	298 0061	3/12	24	Epson QX Private Support	Epson
ESCO Fido #612	363 6489	3/12	3p-6aMF	Equestrian messages/discussions	IBM
Falcon's Nest	451 5680	-0-	24	Apple II Casino	Apple
Financial Teleshare	1 493 4316	3/12	24	-0-	IBM
Fuzzy's Board	296 9142	-0-	-0-	Commodore	C-64
FWSO	755 8263	-0-	24	Apple II General	Apple
Gameroom, The	796 7022	3	24	-0-	-0-
Genesis	423 6462	3	24	-0-	-0-
GJ Mug	1 243 5303	-0-	10p-6a	IBM Messages	IBM
GJ Net	1 242 8103	-0-	6p-8a	-0-	-0-
Gulliver UMC	1 351 2682	-0-	24	Apple II Education	Apple
Invasion of HQ	771 8139	-0-	24	Apple messages/downloads	Apple
Kitten RBBS	451 9201	3/12	24	AT&T MS DOS	AT&T
MAD Headquarters	674 4768	3	24	-0-	-0-
Melnibone	238 5819	-0-	24	Apple II discussion	Apple
Mile Hi Cuss	871 2912	3/12	24	Messages/downloads	IBM
Moon Patrol	469 8295	3	24	Apple II Messages	Apple
Mountain View	447 2282	3	24	Adult board - downloads C-128	C-128
Mousetrap	791 0686	3/12	24	Mac/Amiga/Atari ST	-0-
Mycroft	699 7195	-0-	24	Atari ST messages	Atari
Off the Wall	443 3367	3	24	Apple	Apple
Online P.DBMS#2	755 5300	3/12	24	-0-	-0-
Operating Room, The	779 4579	3	24	Apple II Messages	Apple
Pern	239 9760	3/12	24	Commodore	C-64
Pirate's Ship, The	420 9851	3	24	-0-	-0-
Preferred Info Systems	477 6595	-0-	24	Kaypro-10	Kaypro
Prom Blaster	422 3759	3/12	24	Apple IIc	Apple
Protech Support	758 3783	3/12/24	24	Eamon, RP games Apple	Apple
QCIN	759 7389	3	nights	Commodore 64 Messages	C-64
Radio Board	733 5787	3/12	24	Osborne	Osborne
RCP/M DACS	989 9638	3/12	24	-0-	-0-
Republic VBBS	450 7959	-0-	24	TRS-80 Messages	TRS
Retreat, The	466 2293	3/12	24	Apple II Christian orientation	Apple
Rocky Mountain Outpost	841 8559	3	24	-0-	-0-
Rosetta Symphony	422 3649	3	9p-6a	Atari Messages	Atari
Softcom	697 0756	3	10p-630a	Commodore	C-128
Software Review Board	695 4518	3	7p-12p	TRS-80 Messages/Software reviews	TRS
Star Systems	467 9965	3	24	Commodore messages/downloads	C-64
Starcon BBS	935 5850	3/12	24	Atari/Sci Fi Convention listings	Atari
Stock Market BBS, The	369 8397	3/12	24	Stocks, general messages	Apple
TBBS Unlimited	989 8257	3/12	4p-6a	-0-	-0-
Teacher's Chalkboard	797 0429	3/12	24	Education messages for teachers	Apple
The 5th Dimension	671 8794	3	7p-530a	Atari Adventure games	Atari
TOS Headquarters	292 9847	3	9p-11a	-0-	Zenith

BOARD	TELEPHONE	BAUD	HRS	DESCRIPTION	SYSTEM
Colorado Fire Net	1 591 7415	-0-	-0-	-0-	-0-
Cotton Club 2	699 8675	3/12	24	-0-	-0-
Downhome MBBS/The Lazy L	665 9520		24	-0-	IBM
Elite III	278 8778	12	24	Apple II Games, polls, downloads	Apple
ERL Fido	497 5868	3/12	24	Software downloads/messages	IBM
GBBS PC Test Site #1	690 1634	3/12	24	-0-	IBM
Ghost Mansion	427 3282	3	24	Apple II Educational	Apple
Gold Strike Board	278 1487	3	24	Apple II downloads (18M)	Apple
Hand-Zone	343 6427	-0-	24	Messages	TRS
Hotel, The	699 7886	3/12	24	Commodore	C-64
Jeffcom IV	421 7682	3/12	4p-7a	Apple II Educational	Apple
Not Heaven	452 6587	3	nights	Commodore	C-64
Pratt's Info Mountain	1 586 8197	3/12	6p-7aMF	Tourism	IBM
ProDos GBBS II	778 7415	3/12	24	Apple II Prodos	Apple
Professional System, The	748 2223	3/12	24	Boards for writers,lawyers, cpa	IBM
Rain Forest	428 5648	-0-	-0-	Commodore	C-64
Ramnet	1 598 7667	-0-	-0-	Rampart High School	-0-
Resort	425 2644	-0-	24	Apple II Messages	Apple
Roc Haven	789 3238	-0-	10p-6a	-0-	Atari
Softlogic Solutions Inc.	(683)644-5556	-0-	-0-	-0-	-0-
Star Board	455 3113	3/12	24	Astronomy, computer, messages	TRS
Stargate	422 8769	3	24	-0-	-0-
Suffragette	421 1561	3	24	Commodore messages	C-64
Ye Olde Software Shop	469 5818	-0-	24	RP Games	Apple
Z-Node	688 9825	3/12	24	CP/M messages/downloads	CP/M
ZAP!	367 4183	-0-	-0-	Atari/ST/8 bit	Atari